11:45

VASODILATOR RESERVE PERSISTS DISTAL TO A CHRONIC CORONARY ARTERY STENOSIS DESPITE REDUCED MYOCARDIAL BLOOD FLOW

William Gray, Jonathan Bier, and Henry Gewirtz, Brown University and Rhode Island Hospital, Providence, Rhode Island

We tested the hypothesis that reduced myocardial blood flow with vasodilator reserve occurs not only in an acute but also in a chronic and more clinically relevant model of coronary artery stenosis. Thus via sterile thoracotomy, a coronary artery stenosis was placed around the mid left anterior descending coronary artery of six pigs. Each had coronary arteriography four to six weeks post-op along with measurement of regional myocardial blood flow (RMBF; microspheres) at control and with maximal IV adenosine (Ado; 30 mg/min X 5 min; with and without IV neosynephrine to support arterial pressure). Arteriography revealed a severe (>80% DIA reduction) coronary artery stenosis with antegrade flow in each pig. In one pig only a small infarct zone was present and excluded from data analysis. Endocardial and epicardial RMBF (ml/min/g) and resistance (Res;mmHg/ml/min/g) in left anterior descending (LAD) and circumflex zones (CX) were (Mean±SD):

	Baseline		Adenosine	
	RMBF	Res	RMBF	Res
LAD/Endo	1.05±0.34*	47±20	1.84±1.27	17±15#
CX /Endo	1.47±0.43	67±20	3.31±1.92	20±11
LAD/Epi	1.02±0.23*	66±16	2.75±1.45	10±5#
CX /Epi	1.35±0.33	77±23	4.37±1.68	14±3

* =P<.01 vs respective circumflex zone; # =P<.01 vs Base:Res

Thus, although RMBF in both endocardium and epicardium distal to a chronic coronary artery stenosis was reduced at rest, vasodilator reserve persisted in each layer. Minimal resistance was equal in both zones. The data also indicate a chronic, low flow state may exist distal to a severe coronary artery stenosis under clinical conditions.

Tuesday, March 5, 1991
Poster Displayed: 9:00AM–12:00NOON
Author Present: 9:00AM–10:00AM
Hall F, West Concourse
New Approaches to Angioplasty

EFFICACY OF LOW-PRESSURE, THERMALLY-MEDIATED BALLOON ANGIOPLASTY AS ASSESSED BY INTRAVASCULAR ULTRASOUND

Daniel B. Fram, Brenda W. Sanzobrino, Joseph F. Mitchel, John P. Fisher, Francis J. Kiernan, Linda Gillam, Arnold Fieldman, John E. Abele, Raymond G. McKay. Hartford Hospital, University of Connecticut, Hartford, CT.

The efficacy of low-pressure, thermally-mediated balloon angioplasty was assessed in 9 anesthetized pigs using intravascular ultrasound and a newly-designed, temperature-controlled balloon dilatation catheter. The catheter employs bipolar radiofrequency circuitry and a variable output generator that was used to heat balloon fluid to a selectable temperature and for a variable duration. A total of 39 iliac and carotid arterial segments were serially dilated at two atmospheres for 75 seconds at 37°C (cold inflations) and for 10-60 seconds at 40-70°C (hot inflations). Balloon/vessel diameter ratio averaged 1.3 for all segments. Arterial cross sectional area (CSA) and vascular morphology were assessed using a 6Fr 20 MHZ intravascular ultrasound catheter at baseline and after each cold and hot inflation. A 10% increase in CSA was considered to be a significant change. Elastic recoil was assessed in 14 segments with repeat area measurements at 10 and 30 minutes post-dilation. Arterial CSA measured 0.19 cm^2 at baseline, increased to 0.21 cm^2 after cold inflation and further increased to 0.24 cm^2 after hot inflation. Significant increases in CSA occurred in 65% of segments dilated at 40°C, in 76% dilated at 50°C, and in 88% dilated at 60°C. Elastic recoil was apparent in 3/4 cold segments and 1/12 hot segments. As visualized by ultrasound, intimal dissections occurred after 3/37 cold inflations and after 1/118 hot inflations. CONCLUSION: Low-pressure, thermally-mediated balloon angioplasty more effectively dilates vascular tissue, prevents elastic recoil and produces fewer dissections than conventional balloon angioplasty as assessed by intravascular ultrasound.

THERMAL PERFUSION BALLOON ANGIOPLASTY

Christopher E. Buller, Michael H. Sketch, Jr., Harry R. Phillips, Richard S. Stack, Duke University Medical Center, Durham, North Carolina.

The perfusion balloon catheter (PBC) (Stack™ Perfusion Dilatation Catheter, ACS, Inc.) has been utilized clinically to allow gradual prolonged inflations during coronary angioplasty. The addition of thermal energy during the prolonged dilatation process could theoretically help seal dissection planes as they were formed. This combined therapeutic approach could potentially improve actual PTCA success rates and produce a smooth lumen resulting in a rheological environment favorably influencing restenosis. Thus a novel thermal PBC catheter (TPBC) was developed using radio frequency (RF) energy.

The safety of this new device has been tested in the canine model. Fourteen mongrel dogs underwent TPBC coronary angioplasty at 37°, 60° or 80°C for 1.5, 5, or 15 minutes. Coronary and ventricular angiography, electrocardiography, CPK-MB, erythrocyte morphology, and haptoglobin were recorded before, immediately after, and 24 hr after angioplasty. Treated coronary segments were serially sectioned for histologic analysis.

All treated coronary segments and adjacent branches remained patent. No evidence of coronary spasm, thrombosis, hemolysis, or ischemia was observed. The histologic extent of thermal effect within treated segments was proportional to both temperatures and duration of treatment.

Thus, the TPBC can be applied safely in the canine coronary environment. Integrating thermal and perfusion technologies allows prolonged treatment duration to produce desired thermal effects.

SCANNING ELECTRON MICROSCOPY ANALYSIS OF CORONARY ANGIOPLASTY DEVICES: COMPARISON BETWEEN USE OF IOXAGLATE AND IOPAMIDOL

Raoul Bonan, Claire Corot, Rosy Eloy, Madeleine Parisella, Montreal Heart Institute, Montreal, Canada

Scanning electron microscopy analysis of guiding catheter, guidewires and balloon catheters was used to evaluate the relation between low osmolar contrast agents and thrombotic events. Ten patients were prospectively randomized for their angioplasty between ionic Ioxaglate (IX), 158±46 cc and non-ionic Iopamidol (IO), 160±73 cc using the same devices and with equivalent procedure time (IO= 25.6±13.9 mn vs IX= 23.2±7.0 mn, p=NS). Routine antiplatelet agents and heparin were used with a PTT>150 sec during the entire procedure. Scanning electron microscopy examination was done blindly by 2 observers independently on encoded documents for: protein deposit, platelets, fibrin, RBC's and thrombi.

	IO	IX	p
Guiding catheter			
protein deposit %	64±21	20±17	0.01
platelet adherence (0-3)	2.8±0.4	1.2±0.4	0.0005
platelet aggregates (0-3)	1.6±0.5	0.4±0.5	0.003
Guidewire			
protein deposit %	66±26	36±24	NS
thrombus (0-3)	1.8±1	1.4±1	NS

Surface analysis of the devices permits one to differentiate patients receiving IO from IX in 80% of the cases. IO is associated with larger cover of the inner catheter surface by protein deposit and a greater platelet activation than IX.

In conclusion, IX inhibits more acutely the hemostasis activation initiated by the device than IO. However, neither fibrin formation or extensive thrombus were encountered with the anticoagulation regimen used.